

# Expansion of a National Differentiated Service Delivery Model Increases Access to Treatment for HIV and Other Chronic Conditions in South Africa

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## Research Article

**Keywords:** HIV, chronic conditions, service delivery model, South Africa

**Posted Date:** January 4th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-122176/v1>

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## Abstract

**Background:** South Africa is home to 7.7 million people living with HIV and supports the largest antiretroviral therapy (ART) program worldwide. Despite global investment in HIV service delivery and the parallel threat of non-communicable diseases (NCDs), there are few examples of integrated programs addressing both HIV and NCDs through differentiated service delivery. In 2014, the National Department of Health (NDoH) launched the Central Chronic Medicines Dispensing and Distribution (CCMDD) program to provide patients with chronic disease, including HIV, with differentiated access to medications via community-based pick-up points. This study describes the expansion of CCMDD to national scale.

**Methods:** Yale monitors CCMDD enrollment as part of its mixed methods evaluation of Project Last Mile (PLM), a national technical support partner for CCMDD since 2016. From March 2016 through October 2019, cumulative weekly data on CCMDD uptake [patients enrolled, facilities registered, pick-up points contracted], type of medication collected [ART only; NCD only; and ART-NCD] and of collection site used [external pick-up points; adherence/outreach clubs; or facility-based fast lanes], were extracted for descriptive, longitudinal analysis.

**Results:** As of October 2019, 3,436 health facilities were registered with CCMDD across 46 health districts (88% national coverage), and 2,037 external pick-up points had been established. A total of 2,069,039 patients were active on CCMDD, a significant increase since 2018 ( $p < 0.001$ ), including 76% collecting ART [64% ART only, 12% ART plus NCD/comorbidities] and 479,120 [24%] collecting for chronic diseases only. Further, 734,005 (35%) of patients were collecting from external pick-up points, a 73% increase in patient volume from 2018.

**Discussion:** This longitudinal description of CCMDD provides an example of a path to national scale for a differentiated service delivery model that integrates management of HIV and noncommunicable diseases. This study demonstrates the success of the program in engaging patients who are not living with HIV, which bodes well for the potential of the program to address the rising burden of NCDs in South Africa.

**Conclusion:** The results signal potential for expansion in resource-limited settings, particularly in the context of private sector strategic support.

## Background

In 2019, South Africa was home to 7.2M adults living with HIV (one in five adults), and supported the largest antiretroviral therapy (ART) program worldwide, with 4.8M on treatment [1]. South Africa also has a growing burden of non-communicable diseases including diabetes and hypertension, which account for 51% of mortality and eclipsed the death rates from communicable diseases in 2016 [2–4]. As nations adopt the UN 90-90-90 strategy, and strive towards the 2030 Sustainable Development Goals, there is heightened interest in models of differentiated care to ensure that health services and related medicines are available and accessible to those who need them, when and where they are needed most [5]. Further, there is a call to integrate HIV services with NCD care, maximize resources, and address co-morbidities in tandem [6, 7].

While several models of differentiated service delivery (DSD) have been shown to mitigate costs and the burden of care for people living with HIV (PLHIV) [8–12], descriptive evaluations of DSD programs achieving national scale are lacking [13, 14]. Further, few national programs offer multiple modalities of differentiated care (both facility- and community-based; individual- and group-driven), and enable patient choice in uptake [13–15]. Longitudinal evaluations of the path to national scale for such programs would support evidence-informed global investment in scale-up and sustainability for DSD [16–18].

Therefore, this study was conducted to evaluate the longitudinal expansion of the South African National Department of Health (NDoH) Central Chronic Medicines Dispensing and Distribution (CCMDD) programme. Launched in 2014, CCMDD is

designed to enable patients with HIV and non-communicable diseases (NCDs) to access their medicines from community-based pick-up points where they live and work. In 2016, the NDoH engaged Project Last Mile to catalyse expansion of the program from the initial 11 pilot districts to national scale [10, 19]. This expansion is described over a 3.5 year period with increasing levels of detail as routine program monitoring systems were strengthened over time. We anticipate that the results will be useful to practitioners and policymakers planning to scale-up innovative models of integrated service delivery, as well as to researchers evaluating and comparing DSD models.

## Methods

### Program Description

The CCMDD program is situated within the National Health Insurance (NHI) program and is intended to improve access to medications for people living with chronic disease including HIV, and to address demand associated with expanded access to ART envisaged under the Universal Test and Treat Guidelines activated in late 2016 [19]. The program is available to people who meet the eligibility criteria shown in Table 1 [20].

**Table 1.** Patient-level eligibility criteria for enrollment in CCMDD as of March 2018

<b>People living with HIV who are on ART:</b>	
i.	On same treatment regimen for at least 12 months
ii.	Most recent lab results are normal <ol style="list-style-type: none"> <li>a. Most recent viral load result taken in past six months</li> <li>b. 2 consecutive viral loads are undetectable</li> </ol>
iii.	Clinic confirms eligibility via <ol style="list-style-type: none"> <li>a. Stable and adherent to treatment</li> <li>b. No current TB</li> <li>c. No medical conditions requiring regular clinical consultations</li> </ol>
iv.	Chronic medication items are on the provincial CCMDD medicine list
<b>People with chronic non-communicable diseases:</b>	
i.	For diabetic patients – 2 consecutive fasting plasma glucose (FPG) levels normal;
ii.	For hypertensive patients – 2 consecutive blood pressure (BP) readings normal

Eligible patients referred to the program voluntarily register and select a pickup point (PuP) from which to collect their medication every two months, returning to the health facility every 6 months for their prescription to be renewed. PuPs include external pick-up points (external PuP) in community-based retail locations including independent pharmacies; community-based outreach clubs or adherence clubs; and fast lanes which are based at registered health care facilities. External pick-up points are contracted by the NDoH to dispense parcels of medications to participating patients. Parcels of medication are pre-dispensed and distributed by two service providers who have a government tender to distribute medication throughout the eight participating provinces in South Africa (excludes Western Cape). Medication is provided by the provinces as per their medicine list. Participation in the program is free-of-charge to patients.

PLM (described previously) is a global health public-private partnership that aims to strengthen health systems across Africa [21], evaluated using a longitudinal, mixed-methods design across country settings (previously described [22]). Since 2016, Project Last Mile has worked in partnership with the South African National Department of Health (NDoH) with funding from the United States Agency for International Development (USAID) to provide strategic support for CCMDD expansion. This has included (1) geomapping analytics to inform gaps in CCMDD coverage, (2) business case development to support national investment, (3) execution support to promote consistent PuP standards across the country, and (4) private sector engagement to support retailer-based pick-up points and to explore innovative modalities for CCMDD expansion.

This study, part of the larger evaluation, is based on data from 2016–2019 across 8 provinces participating in CCMDD across South Africa: Eastern Cape, Free State, Gauteng, KwaZulu-Natal, Limpopo, Mpumalanga, Northern Cape, and North

West (Western Cape is not participating), and includes all 46 districts of the participating provinces.

## Measures of CCMDD programme expansion

CCMDD expansion was monitored from March 2016 through October 2019 (3 years, 7 months) using four measures: (1) the number of districts onboarded; (2) the number of health facilities registered; (3) the number of external pick-up points (external PuP) contracted; and (4) the number of patients registered. In January 2018, we began to monitor the number of patients who had ever registered with CCMDD (registered patients) and the number of patients who had an active prescription (active patients). In November 2018, data were made available to differentiate active patients by (1) the type of medications that they were collecting (measured as ART, non-communicable disease, or a combination of ART and NCDs) and (2) patient's choice of where medication parcels were collected (measured as external PuPs; outreach/ adherence clubs, and facility-based fast lanes).

## Data collection and ethics

This study is based on district-level administrative data generated by the CCMDD program. The service providers who deliver the parcels for CCMDD program provided weekly reports on client volumes to the NDoH, managed in an Excel file for further analysis. All data analysis procedures were approved by the South African National Department of Health (NDoH). As not human subjects research, the study was exempted from continuing review by the Human Subjects Committee of Yale University. This study was performed in accordance of the Declaration of Helsinki.

## Statistical analysis

Standard descriptive statistics were used to quantify the CCMDD programme expansion during the duration of PLM's strategic support, from March 2016- October 2019. The summary statistics are presented for changes in the registered health care facilities, registered external PuPs, registered and active patients, as well as active patients by their medication and their parcel collection point, respectively, over the time frame from when these indicators were monitored. All analyses were performed using Stata SE15 (StataCorp, Texas) and Microsoft Excel (version 15.21.1).

## Results

As shown in Fig. 1, CCMDD was operating in 16 of 46 districts at the start of March 2016, and expanded to reach all districts from 8 participating provinces (88% nationally) by January 2018. From March 2016 through October 2019, the number of health facilities increased from 972 to 3436 (representing 94.6% of all facilities in the participating districts), and the number of external pick-up points increased 12-fold over the observation period, from 164 to 2037.

As the numbers of facilities and external PuPs increased, so did the number of patients served by CCMDD (Fig. 2). Over time, the number of registered patients has expanded over 8-fold (Fig. 2), reaching a total of 2,993,044 registered patients and 2,069,039 active patients (69.1% registered patients were active) by October 2019.

As more granular data on patients' medication became available, it was found that roughly two-thirds of all active patients were receiving ART only and that, over time, there has been a significant increase from 7–12% in the proportion of patients who are receiving both ART and medications for other chronic conditions through CCMDD ( $p < 0.001$ ). As of October 2019, the majority of patients (76%) were collecting either ART only or ART in combination with medications for chronic conditions ( $n = 1,429,052$ ), with 24% or 479,120 people collecting medications for chronic disease only. Over time, the number of active patients collecting for each type of medication, i.e., those receiving ART only, ART in combination with medications for chronic conditions (ART NCD), and chronic disease only (NCD only), increased significantly ( $p < 0.001$ ).

As shown in Fig. 3, all three types of medication distribution sites (external PuPs, outreach and adherence clubs, and clinic fast lanes) experienced significant increases in patient volume over time ( $p < 0.001$ ). In the year between November 2018 and October 2019, the proportion of active patients relying on clinic-based fast lanes decreased from 55–52% while the

proportion using external PuPs increased from 31–35% ( $p < 0.001$ ). By the end of the study period, 734,005 active CCMDD patients were collecting from external pick-up points, a 73% increase in patient volume to those locations for the year.

## Discussion

This study describes the path to national scale for South Africa's Central Chronic Medication Distribution and Dispensation (CCMDD) program during Project Last Mile's support. CCMDD is a differentiated service delivery model designed to improve access to medications and retention in care for patients with stable, chronic disease while decongesting public health facilities. From March 2016 through October 2019 (3 years, 7 months), there were significant increases in the number of districts participating in the program (reaching full saturation in 8 of South Africa's 9 provinces in January 2018), the number of health facilities enrolled; the number of external pick-up points registered; and the number of patients engaged. By the end of March 2019 [per District Health Barometer 2018/2019] [23], there were 2,850,325 adults on ART from participating districts who were virally suppressed, of which 1,068,938 or ~ 37.5% were actively enrolled in CCMDD.

As the CCMDD program's administrative processes and operational systems strengthened, more detailed insights into specific areas of growth were gained. The proportion of active patients who received medication for chronic diseases other than HIV (either alone or in combination with ART) increased during the last year of the reported period, with one out of four collecting medications for non-communicable diseases only. This trend highlights the potential of the program in offering integrated NCD and HIV treatment [24–26], a global priority. In particular, these data demonstrate the success of the program in engaging patients who are not living with HIV, which bodes well for the potential of the program to address the rising burden of NCDs in South Africa [27] and serves to help overcome any stigma associated with differentiated service delivery models being labeled as HIV-only program [28].

Patients' choice of pick-up points evolved over time, and there were increasing numbers and proportions of patients opting to collect their medications at external pick-up points, particularly as more of these pick-up points became available. This is particularly encouraging because this option serves to most fully unburden public facilities, affording patients access to medications in convenient locations close to home or work, and is aligned with Project Last Mile's strategic and technical inputs (geomapping to inform placement of external PuPs, engagement of retailers across the country, and innovation in new external PuP models in areas that lack brick and mortar solutions, eg. SmartLockers). We also observed growth in the number of patients choosing to collect their medications at outreach and adherence clubs, as well as clinic-based fast lanes, demonstrating the continued value of these options.

At the end of the observation period, nearly 70% of patients ever registered with CCMDD were considered active. This proportion signals relatively high levels of retention within the program, but also highlights the need for future research to understand the experiences of the remaining 30% of registered patients who were no longer active in the program.

Our findings should be interpreted in light of their limitations. First, the trends described herein are based on analysis of routine aggregate administrative data. The systems for tracking this data became more robust over time (as evidenced by increasingly granular data in later periods). New contracts were awarded to two Service Providers who dispense medications in April 2018 and a transition period ensued until September 2018, introducing data errors. However, we report on trends over weekly reporting intervals from 43 months of data collection, increasing the confidence in the overall observations. Second, this study evaluates expansion of the program from the national level, does not explore district- or provincial-level variation in uptake of the CCMDD program or urban/rural distinctions. Further analysis to understand this variation could be useful to those seeking to accelerate progress toward national scale in other settings. Third, sociodemographic data were not available for review to understand the demographics of patients participating in the CCMDD program (sex, age, ethnicity) which would assist to understand program reach and retention. Fourth, program metrics associated with clinic decongestion including staffing, patient volume at clinics, and health care worker satisfaction were not assessed to understand the impact of scale up of CCMDD at facility-level, and should be evaluated in

the future. Fifth, the patient-experienced benefits associated with CCMDD, including satisfaction with care and clinical outcomes were not quantified.

It should also be noted that the observation period for this data is not inclusive of the Dolutegravir (DTG) rollout (launched December 2019) or changes in CCMDD eligibility criteria to engage patients on ART with viral suppression at six months instead of 12-months (revised March 2020), both of which may have potential impact on CCMDD uptake and retention [29]. Despite these limitations, these data inform future implementation of differentiated service delivery and will be useful for other countries considering how to expand or establish chronic medication dispensing models, particularly in resource-constrained settings with high patient volume and clinical staff shortages. Notably, decentralizing routine medication collection, particularly for those living with chronic disease who may be vulnerable to infectious diseases, has become of increasing importance as health systems adapt to the global threat of the COVID-19 pandemic [30–34].

## Conclusions

In the context of South Africa’s impressive commitment to “universal test and treat” [5] for all people living with HIV and need to address an increasing burden of NCDs [6, 7], and in response to global demand for DSD models that can work at scale [16–18], this longitudinal description of CCMDD provides an example of a path to scale for a national differentiated service delivery model, initially piloted in a small number of districts, that now reaches 88% of all South African health districts and ~ 95% of facilities in those districts. This quantification of CCMDD’s reach, supported by proactive integration of private sector business expertise into both strategic planning and operationalization through the PLM partnership [22, 35], will be useful to practitioners and policymakers promoting scale-up of innovative models of service delivery, as well as to researchers evaluating and comparing DSD models within and across country settings. It also signals potential for integrated models that integrate HIV resources with NCD care, and highlights the value of strategic private sector support for DSD programs [22, 35].

## List Of Abbreviations

ART	Antiretroviral Therapy
CCMDD	Central Chronic Medicines Dispensing and Distribution program
GHLI	Global Health Leadership Initiative
HIV	Human Immunodeficiency Virus
NDoH	National Department of Health
NCD	Non-Communicable Disease
NHI	National Health Insurance
PLM	Project Last Mile
PuP	Pick-up Point
SDG	Sustainable Development Goals
UN	United Nations
USAID	United States Agency for International Development

## Declarations

**Ethical approval and consent to participate:**

This study was performed in accordance of the Declaration of Helsinki as part of Yale's longitudinal, mixed-methods evaluation of the PLM partnership across country settings. We used administrative data from the CCMDD program which was aggregated by district and by month. This study did not include individual-level data. All data analysis procedures were approved by the South African National Department of Health (NDoH). As not human subjects research, the study was exempted from continuing review by the Human Subjects Committee of Yale University.

**Consent for publication:**

Not applicable.

**Availability of data and materials:**

The data that support the findings of this study are available from the Project Last Mile programme but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Project Last Mile programme.

**Competing interests:**

The authors declare no competing or conflicting interests. Dr. Shenoï's spouse worked for Merck pharmaceuticals 1997-2007 and retains company stock in his retirement account. There is no conflict of interest, but it is included for full disclosure. The content is solely the responsibility of the authors and does not represent the official views of the funding agency or other project partners.

**Funding:**

The Global Health Leadership Initiative (GHLI) at Yale is funded to evaluate Project Last Mile by the United States Agency for International Development (USAID) (funding for research personnel) and The Coca-Cola Company (funding for travel and other direct costs). Project Last Mile in South Africa is funded by USAID exclusively. The financial support from USAID is administered by the Global Education and Technology Foundation (GETF), located in Washington, DC. Dr. Sheela Shenoï is independently supported by the Doris Duke Foundation, grant #2015216.

**Authors' contributions:**

All authors made substantial contributions to the design of study, including but not limited to data acquisition, data analysis, and interpretation of results. SC, LL and ELL drafted the original manuscript with early revisions from SVS and MD; LL analyzed the data with supervision from MD and interpretation from MP, PR and MM; SC, PR, MP, MM, MD and ELL were involved in data collection, data retrieval, data synthesis, and monitoring and evaluation of CCMDD as part of Project Last Mile evaluation; all authors have read the manuscript, provided critical review, and approved the final manuscript.

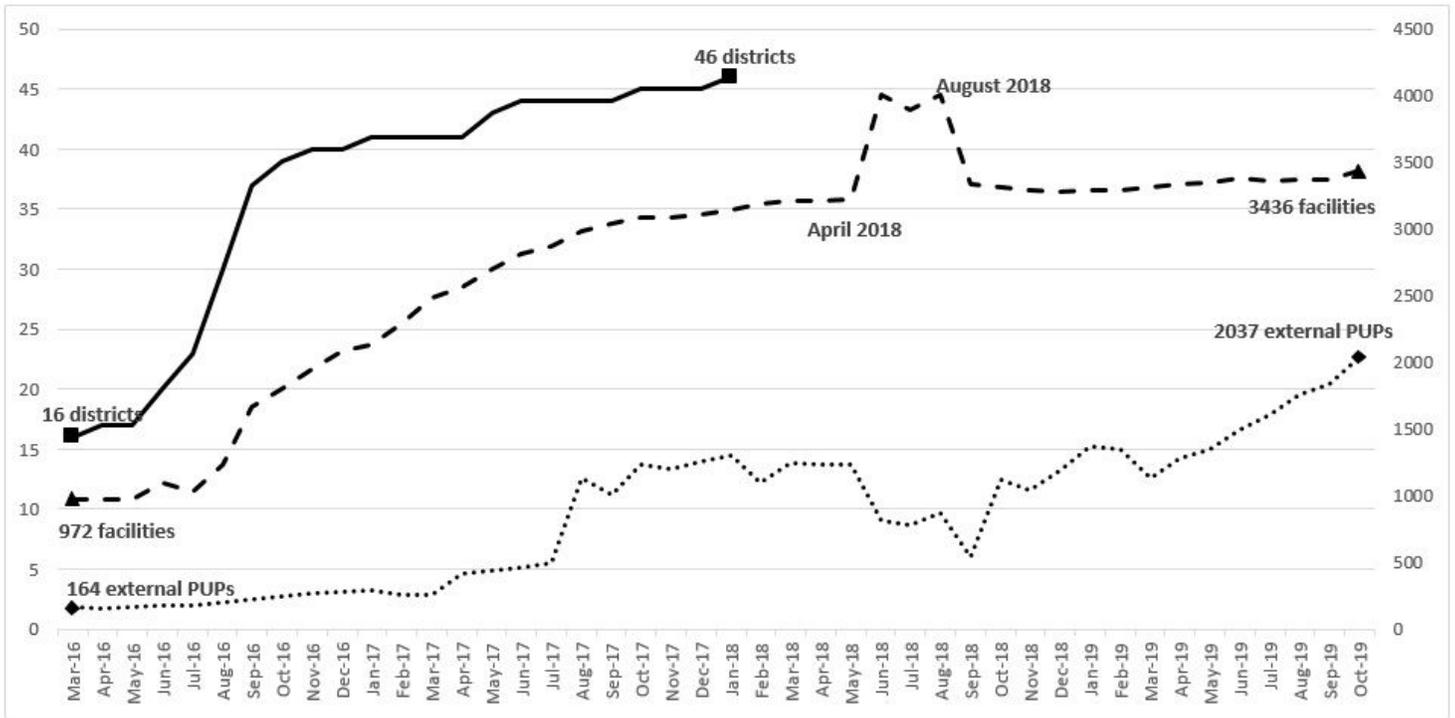
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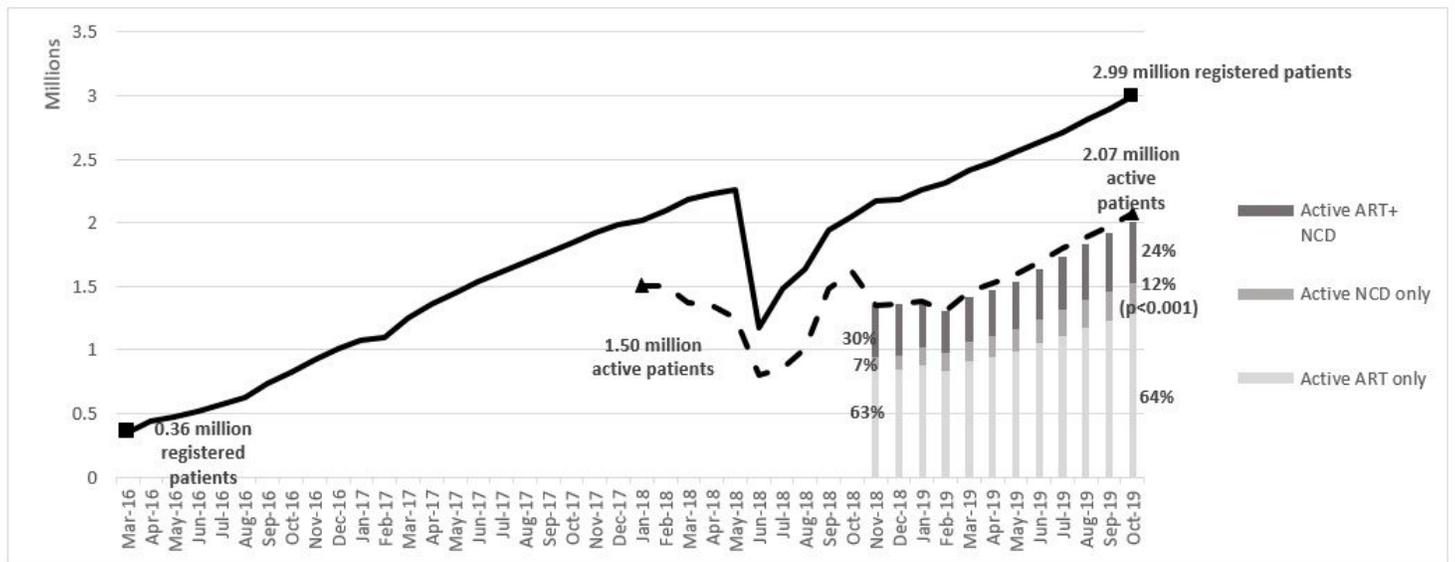
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## Figures



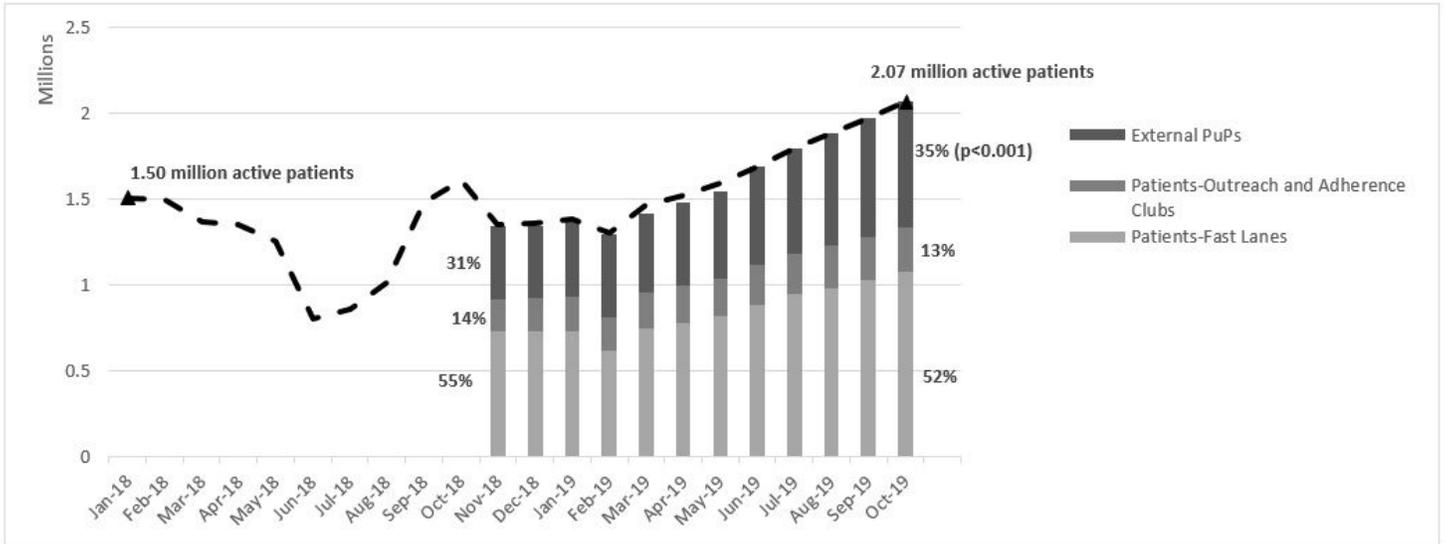
**Figure 1**

Number of Districts, Facilities, and External Pickup Points (external PuPs) Registered in the Central Chronic Medicines Dispensing and Distribution (CCMDD) Programme; from March 2016 through October 2019\*



**Figure 2**

Number of Registered and Active CCMDD Patients from March 2016 through October 2019, and distribution of active patients by medication type; from November 2018 through October 2019\*



**Figure 3**

Number and proportion of active CCMD patients selecting to receive their medication at external PuPs, outreach and adherence clubs, and clinic-based fast lanes; from November 2018 through October 2019\*